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(54) Conveyor Deflector Mechanism

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TITLE

CONVEYOR DEFLECTOR MECHANISM

ABSTRACT OF DISCLOSURE

A conveyor deflector device is disclosed which is particularly suitable for deflecting fragile articles in transit along a conveyor. A deflector member having one end fixed is resiliently deformable under the influence of a control arm acting on its free end. In this manner, the deflector member is controlably positionable in the path of articles traversing the length of the conveyor, whereby the destination of those articles may be controlled in accordance with the degree of deflection imparted each as a consequence of the member's position.

The present invention is concerned with conveyor systems and in particular, devices for removing articles travelling on a moving conveyor.

BACKGROUND OF INVENTION

There are many devices for removing articles from a moving conveyor, such devices including air jets, which literally blow selected articles from the conveyor; pivoted rigid arms which rotate to deflect or push articles off the conveyor and piston systems whereby a piston member thrusts articles off the conveyor. In general, the prior art devices have a relatively violent mode of action which precludes their use in association with fragile articles, or their deflection action is fixed in the sense that the objective is efficient, total removal of an article from the conveyor (generally a defective item requiring little or no care) or the article is to be ~~given~~ given a predetermined deflection sufficient to re-orient the article into a subsidary channel. In general, most such devices are only adapted to handle individual articles contained in a stream of articles separated longitudinally.

It is an objective of the present invention to provide a device which is capable of transferring relatively fragile articles at high speed from one moving conveyor to another moving conveyor or the like by a special form of deflecting action.

SUMMARY OF THE INVENTION

According to the present invention there is provided a device for deflecting fragile articles travelling on a conveyor having a conveyor surface and a sidewall, the device comprising a semi-rigid elongate article deflector member, a downstream extremity of which deflector member is carried by a support member adapted to move between a rest position wherein substantially the whole of said deflector member is located substantially adjacent

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to said sidewall, to a position overlying said conveyor surface, an upstream extremity of said deflector member being adapted to remain in contact with the adjacent conveyor sidewall throughout, the deflector member being adapted, by taking up an arcuate configuration, to extend from the sidewall across the conveyor surface to allow said articles travelling on the conveyor to be restrained thereby and be smoothly redirected off the conveyor.

In a preferred embodiment the invention provides a device for deflecting fragile articles travelling on a conveyor having a conveyor surface and a sidewall, the device comprising a semi-rigid elongate article deflector member, an upstream extremity of which is adapted to maintain contact with and slide along the sidewall of the conveyor, a downstream extremity of which deflector member is carried by a support member adapted to move between a rest position adjacent said conveyor sidewall when substantially the whole of said deflector member is located adjacent to said sidewall to a position overlying said conveyor surface, when the deflector member is adapted, by taking up an arcuate configuration extending from said sidewall across the conveyor surface, to allow articles travelling on the conveyor to be restrained thereby to be smoothly redirected off the conveyor.

In a further aspect, the present invention provides a conveyor or system incorporating a deflector device as described above.

The deflector member may be arranged so that, whilst one extremity is in contact with the conveyor sidewall, the other extremity;

(i) may be set in one position overlying the conveyor surface, this deflecting articles travelling along the conveyor, in a uniform manner;

(ii) may be set to oscillate back and forth between the rest position and a predetermined second position overlying the conveyor surface; or

(iii) may be set to move in a series of increments, equal or not, between the rest position and a predetermined second position overlying the conveyor surface.

In the latter two instances, the articles will be deflected from the conveyor at a variety of angles, either continously varying or a set number, respectively.

The use to which the device is being placed determines the mode of operation of the device.

The arcuate, preferably parabolic shape of the deflector member, assisted by the flexible characteristics of the material of which it is made combine to cushion the impact of fragile articles, such as bottles, contacting the deflector member. This action virtually eliminates the tendancy of said bottles, especially when moving relatively rapidly, to rebound off the deflector member, or off bottles already restrained by that member, and consequently greatly reduces the possibility of the bottles upsetting or violently colliding with the adjacent bottles and thus causing highly undesirable breakages on the conveyors.

The deflector member may comprise a strip, usually rectangular, of any suitble semi-rigid material. If the material is too rigid, the required arcuate, preferably parabolic configuration, which is very important as regards the desired gradual and gentle change of direction of the articles such as bottles travelling on the conveyor, will not be realized. If insufficiently rigid, the deflector member will merely be brushed aside by the advancing bottles which, consequently, will not be deflected. A man skilled in the art will have no difficulty in choosing a suitable material from following the teachings herein of the concept behind the present invention and the required properties of the deflector member. For example, many readily available plastic materials are suitable, eg. polyamides such as nylon; and polyalkylenes such as various polypropylenes. In addition, there are many commercially available flexible strip metal materials which fulfill the requirements and hence may be used.

The present invention will be further described with reference to, but not limited by, the accompanying drawings in which:

Figure 1 is a diagrammatic plan layout of a conveyor system incorporating a deflector mechanism of the present invention, the conveyor system supplying a second, and wider, conveyor moving at right angles to the first conveyor;

Figure 1a is a diagrammatic plan view of a further embodiment of the deflector device of the present invention, the device fitting into a conveyor system as shown in Figure 1.

Figure 2 is a detailed angled side elevation of the system shown in Figure 1 taken in the direction of arrow A depicted in Figure 1;

Figure 3 is a detailed angle of side elevation of the system shown in Figure 1 taken in the direction of arrow B depicted in Figure 1; and

Figure 4 is a diagrammatic layout of an article sorting system whereby a stream of articles travelling on a main conveyor is capable of being divided by the action of a deflector mechanism of the present invention into three separate streams utilizing two auxiliary conveyors.

Turning to the device illustrated in Figures 1 to 3 and initially to Figure 1, there is shown a main feed conveyor 10 having a conveyor surface 12 and conveyor sidewall 14, conveyor 10 extending along the edge of a second and wider conveyor 16. In the embodiment shown, conveyor 16 forms part of a pasteurization system, the remainder of the system, including hot water spray nozzles 17, located above conveyor 16, adapted to heat the alcoholic brewery beverage contained in bottles travelling on conveyor 16 to pasteurization temperatures during the bottles' relatively brief period of travel on conveyor 16. Conveyor 16 which is actually about ten feet wide, is shown in Figures 2 and 3, and capped bottles filled with unpasteurized product are fed to conveyor 16 by way of conveyor 10 and the device of the present invention, generally designated 18, effects the task of rapidly transferring large numbers of vertically oriented fragile glass bottles from conveyor 12 onto conveyor 16 and in an evenly distributed manner

so as to spread across substantially all the width of conveyor 16. Conveyor 12 also has a fixed deflector member 13 located in the vicinity of th downstream wall of conveyor 16.

The deflector device 18 is shown in detail with reference to Figures 2 and 3. The device comprises an elongate deflector member 20 which comprises rectangular strips of a plastic material, namely high density polypropylene. The downstream extremity 22 thereof is affixed to support member 24 which is an upstanding rod. The upstream extremity 26 of deflector member 20 is secured by bolts 21 to sidewall member 28 a short distance upstream of support member 30. The latter is affixed to solid conveyor sidewall 28 and carries horizontally oriented lugs 32 each of which is bored to receive an axle 34. Axle 34 is maintained in position by collars 36 and 38, the former riding on lug 32 via a bearing (not shown). Firmly clamped to the upper end of the axle 34 by grub screws is cap 38, provided with a slot 40 which is adapted to pivotably receive and engage via a bolt (not shown) one extremity of swing arm 42, the other end thereof carrying an integral sleeve 44 which engages and rotatably retains support member 24. It will be noted that the full length of deflector member 20 is greater than the length of arm 42. As will be discussed in detail later, that extra length of member 20 allows the latter to take up the desired arcuate/parabolic form upon being rotated from its rest position adjacent sidewall 28.

If extremity 26 is secured to the sidewall 28 at, or downstream of, support member 30, then the length of the material making up member 20 must be greater than the length of arm 42 in order to provide the slack necessary to form the desired arcuate configuration. However, in a further embodiment shown in Figure 1a, the desired result is obtained by arranging for the upstream extremity 26' of deflector member 20' to be free to slide along solid sidewall member 28'. In this embodiment, the resiliency of the semi-rigid deflector member 20 is utilized to create a bias in member 20' which ensures that the portion thereof including the free extremity is constantly urged against the interior surface of

solid sidewall 28'. This is achieved by rigidly affixing the extremity of deflector member 20' to rod 24', rotating the latter, when in position carried by swing arm 42' (shown in phantom), in a clockwise direction and, when the required bias has been "built in" so to speak by permanently tensioning deflector marker 20', clamping rod member 24' to swing arm 42'. This is in contradistinction to the embodiment shown in Figures 1, 2 and 3.

Firmly clamped to the lower portion of axle 34 is collar 35 which carries lug 46 which forms a pivotable linkage in combination with U-shaped member 54 to the piston rod 52 of a pneumatic cylinder 48 which is provided with a compressed air supply line 50. Cylinder 48 is mounted on the conveyor framework in a similar pivotable manner via member 55 and member 57, the latter being affixed to a member of the conveyor support framework.

It need not be elaborated on that conveyor 10 has the usual ancilliary components in addition to those mentioned above; for example, where necessary, additional sidewall members formed by bars 56 and 58, and so on.

The device shown in Figures 1 to 3 operates as follows. A continuous stream of beer bottles are transported via conveyor 10 from a bottle capping station (not shown) to a pasteurizing device comprising in part conveyor 16 and water spray nozzles 17. The number of bottles arriving at the pasteurizer can be as high as 900 per minute. As can be clearly seen from Figures 2 and 3, a large number of bottles arrive en mass so to speak, ie. not separated from each other. The bottles must not only be transferred smoothly from conveyor 10 onto conveyor 16 without falling over or impacting against each other with any degree of force (otherwise bottles may be broken) but must also be evenly distributed over the full width of the pasteurizer. If this is not realized, the whole bottling line would not be able to work to its design capacity. The need to transfer the relatively fragile bottles smoothly, ie. in a non-jerking manner, gently and rapidly onto the pasteurizer conveyor is therefore self-evident.

Initially, the deflector member 20 of the device of the present invention is in its rest position, its full length lying

substantially parallel and adjacent to the interior surface of sidewall 25. Bottles are thus allowed to travel along conveyor 10 until they reach the fixed deflector member 13 which commences to load the left-hand side of the pasteurizer conveyor 16. Such a fixed deflector may be desirable as in the present instances because of the extreme width of the secondary conveyor 16, the relatively small length of deflector member 20 and the very high volumes of bottles being transferred. However, the device of the present invention may, of course, vary in size and can transfer and distribute large numbers of articles from one conveyor to another surface such as a second conveyor.

When it is desired to commence transfer of bottles using the device of the present invention, pneumatic cylinder 48 is activated resulting in piston rod 52 acting via the pivot linkage formed by members 46 and 54 to part rotate axle 34 in a clockwise direction. This results in arm 42 rotating in a clockwise manner carrying support rod 24 and, consequently, the fixed extremity 22 of deflector member 20. The extent to which the arm 42 swings over the conveyor 12 is dependent on the length of stroke of pneumatic cylinder system 50, the length of stroke being adjustable either continuously or in predetermined increments (refer Figure 4 embodiment). Simultaneously, in the Figure 1a embodiment, the free end 26 of deflector member 20' slides longitudinally along the interior surface of sidewall 28 thus providing the "slack" or additional material necessary to enable the deflector member 20 to take up the desired arcuate form, as shown clearly in Figure 2. In the Figure 1 embodiment, where extremity 26 is secured to sidewall 28, the slack is provided by the slightly increased length of member 20. This results in not all of member 20 resting completely against the sidewall but this is not practically significant. The deflector member 20 (20') automatically takes up the arcuate form because of its inherent flexibility. In a situation as presently being considered, adjustment is generally only required in order to find the optimal operating conditions. It may also be noted that the rate of action of the pneumatic cylinder may be varied as well as the time period the deflector device is located at the rest or the operative condition.

As mentioned previously, not all of the bottles actually come in contact with the deflector device: reference to Figures 2 and 3 clearly shows the large "build-up" of bottles upstream of the deflector member 20 and the manner in which moving bottles actually act to urge following bottles in the desired direction and that bottles will be transferred from conveyor 12 to conveyor 16 an appreciable distance upstream of the actual deflector member 20 due to the massing effect of the bottles which, because of the flexible or semi-rigid nature of member 20 can occur without excessive jarring or the like. Moreover, the massing bottles spill over the downstream end 22 of deflector member 22 resulting in bottles loading or filling conveyor 16 downstream of the end 22 of deflector member 20.

This distributing or spreading action may be increased if desired by arranging via suitable adjustment of the pneumatic cylinder system, for the arm 42 to oscillate and this "spraying" action will greatly assist in the bottles being evenly distributed along the secondary conveyor 16.

The device of the present invention is described in Figures 1 to 3 in conjunction with a feed supplier to a pasteurzing system, where the inventive device effects rapid gentle transfer of a large volume of fragile articles, glass bottles in an unstable equilibrium condition, from one conveyor to another at right angles to the first. However, the device of the present invention is versatile and may be used for many other purposes where transference of articles, especially fragile articles, from a conveyor onto another surface and especially a moving surface such as another conveyor is required. One of these applications is the separation of a stream of articles on one conveyor into one or more stream carried by subsidiary conveyor or conveyors. Such a system is shown diagrammatically in Figure 4. A main conveyor 60 feeds two subsidiary conveyors 62 and 64. A deflector device of the present invention 18" is located aside the main conveyor 16 and opposite the entrance to subsidiary conveyors 62 and 64. Device 18" is similar to that numbered 18 and 18' in Figures 1 to 3 and 1a. However, the pneumatic cylinder system is arranged to

move the deflector arm in discrete increments: a first action involving movement of the deflector arm from the rest position shown to position A; and a second action involving movement of the said arm from the rest position to position B. In response to suitable signals from sensing devices, which signals are responsive to a differentiation in a characteristic (size, weight and the like) between moving articles, X, Y and Z..., the deflector arm moves to point A or B and deflects the predetermined article into subsidiary conveyor 62 or 64. The deflector member may be arranged to return automatically to its rest position. Alternatively it is relatively simple to arrange for the deflector member to move to the next position, A, B, or rest as the next response signal dictates. Article sorting systems as shown in Figure 4, including the necessary conveyors, sensing devices, et cetera, are all known in the art and, it is felt, need not be described in detail in this specification.

The present invention, therefore, provides a deflector device which is capable of inter alia, transferring large volumes of moving fragile articles rapidly from one moving conveyor to another. It can also be arranged to function as an article sorting device.

I claim:

1. A device for deflecting fragile articles travelling on a conveyor having a conveyor surface and a sidewall, the device comprising a semi-rigid elongate article deflector member, a downstream extremity of which deflector member is carried by a support member adapted to move between a rest position, when substantially the whole of said deflector member is located substantially adjacent to said sidewall, to a position overlying said conveyor surface, an upstream extremity of said deflector member being adapted to remain in contact with the adjacent conveyor sidewall throughout, the deflector member being adapted, by taking up an arcuate configuration, to extend from the sidewall across the conveyor surface to allow said articles travelling on the conveyor to be restrained thereby and be smoothly redirected off the conveyor.

2. A device for deflecting fragile articles travelling on a conveyor having a conveyor surface and a sidewall, the device comprising a semi-rigid elongate article deflector member, an upstream extremity of which is adapted to maintain contact with and slide along the sidewall of the conveyor, a downstream extremity of which deflector member is carried by a support member adapted to move between a rest position adjacent said conveyor sidewall, when substantially the whole of said deflector member is located adjacent to said sidewall, to a position overlying said conveyor surface, when the deflector member is adapted, by taking up an arcuate configuration extending from said sidewall across the conveyor surface, to allow articles travelling on the conveyor to be restrained thereby be smoothly redirected off the conveyor.

3. A device according to claim 1 or 2 wherein the deflector member is made of a plastic material.

4. A device according to claim 1 or 2 wherein the said downstream extremity of the deflector member is adapted to oscillate between the rest position and a predetermined position overlying the conveyor surface.

5. A conveyor system for conveying and redirecting a stream of articles comprising a conveyor surface for supporting said

articles, a conveyor sidewall adjacent said surface, a semi-rigid elongate article deflector member, an upstream extremity of which is adapted to remain in contact with the conveyor sidewall and a downstream extremity of which is carried by a support member adapted to move between a rest position adjacent the conveyor sidewall, when substantially the whole of said deflector member is located adjacent the said sidewall, to a predetermined position overlying said conveyor surface when the deflector member is adapted, by taking up an arcuate configuration extending from said sidewall to said support member, to allow articles travelling on the conveyor to be restrained thereby and smoothly re-directed off the conveyor.

6. A conveyor system as claimed in claim 5 wherein said support member is carried by an arm member which is adapted to oscillate over the conveyor surface by a rotatable axle member.

7. A conveyor system as claimed in claim 6 wherein said axle is rotated by a piston acting through a coupling arrangement.

8. A conveyor system as claimed in claim 5, 6 or 7 wherein the upstream extremity of the deflector member is adapted to slide freely along said conveyor sidewall in response to movement of the downstream extremity across the conveyor surface.

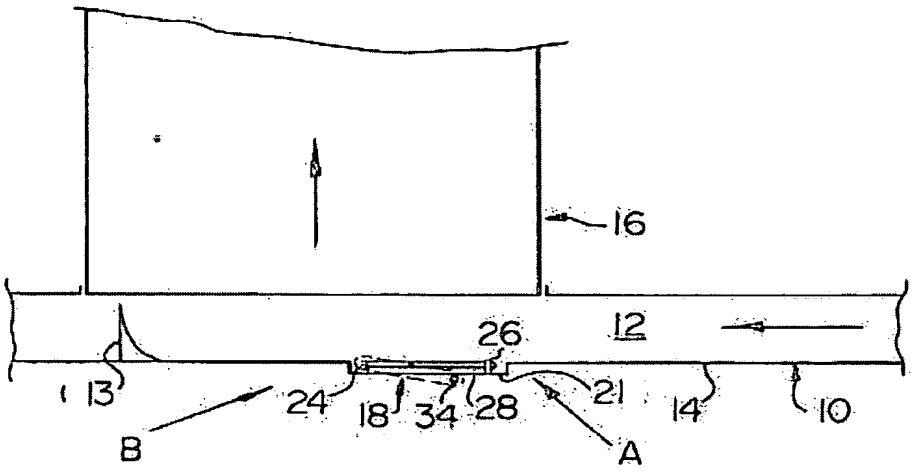

FIG. 1

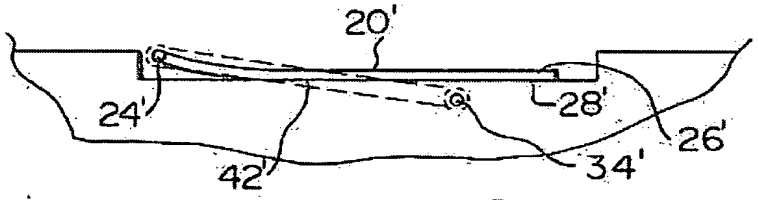

FIG. 1a

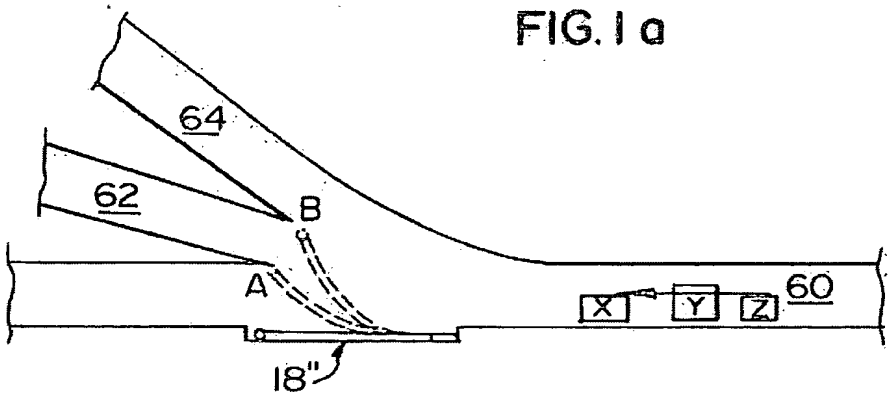

FIG. 4

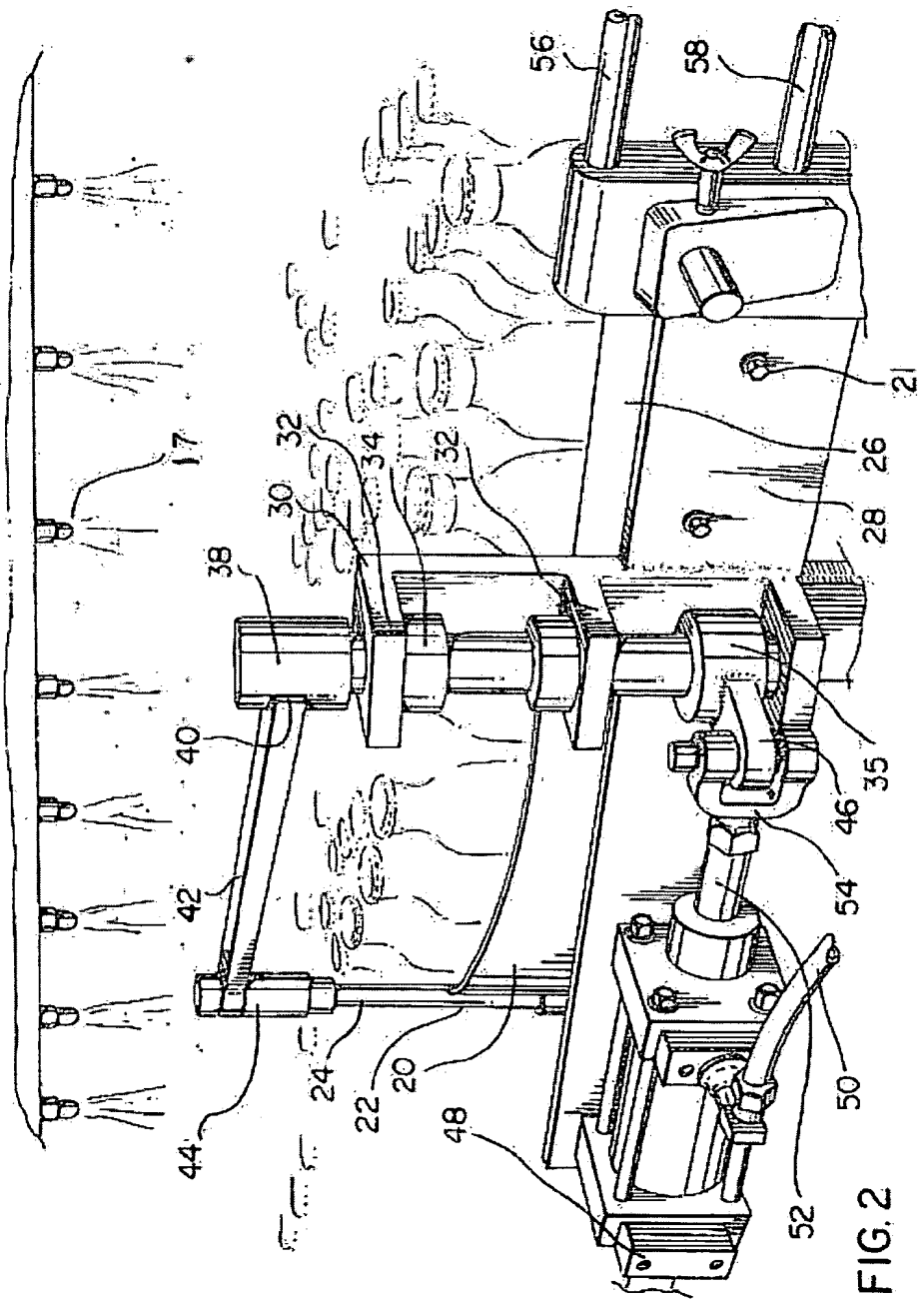

FIG. 2

B

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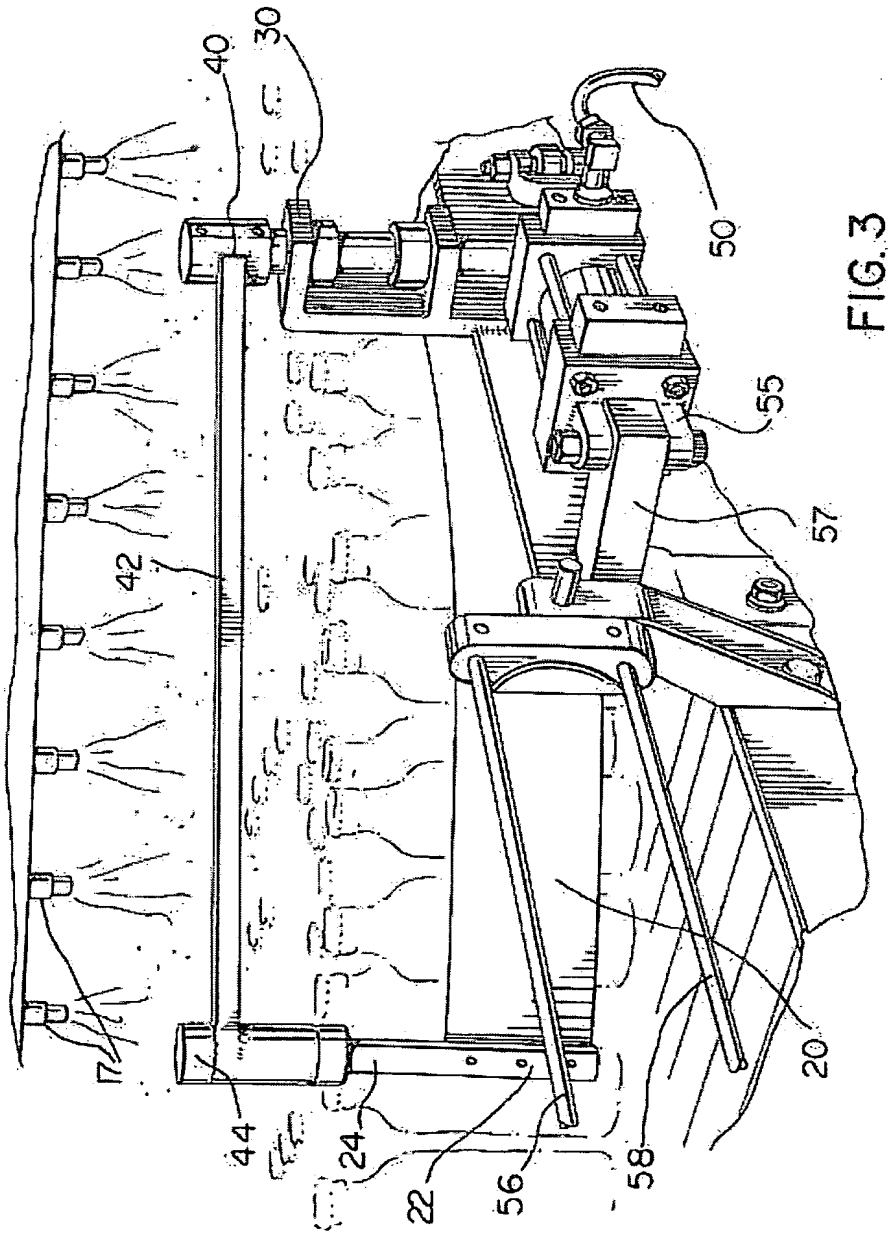

FIG. 3